1   **CLAIMS**

2   We claim:

3

4   1.   A computer-accessible medium comprising:

5   a translator that is operable to receive a non-procedural image annotation

6   template, the translator being operable to translate the non-procedural

7   image annotation template to image annotation source code; and

8   a compiler operably coupled to the translator, the compiler being operable to

9   receive the image annotation source code and to compile the source

10   code into an image annotation executable.

11

12 2.   The computer-accessible medium of claim 1, wherein the non-procedural

13 image annotation template further comprises a mixture of XML and conventional

14 numerical expressions based on C language syntax.

15

16 3.   The computer-accessible medium of claim 1, wherein the image annotation

17 executable further comprises an annotation presentation description.

18

19 4.   The computer-accessible medium of claim 1, wherein the translator further

20 comprises:

21   an iterator object for an expression tree of the non-procedural image

22   annotation template; and

23   a lexical analyzer of the procedural image annotation template.

24

25 5.   The computer-accessible medium of claim 1, wherein the image annotation

26 source code further comprises an object-oriented image annotation source code and

27 the compiler further comprises an object-oriented compiler.

28

29 6.   The computer-accessible medium of claim 5, wherein the object-oriented

30 image annotation source code further comprises Java image annotation source code

31 and the object-oriented compiler further comprises a Java compiler.

1   7.   The computer-accessible medium of claim 1, wherein the image annotation

2   executable further comprises instructions that are native to the processor of a medical

3   imaging system.

4

5   8.   A computer-accessible medium having executable instructions to generate an

6   image annotation executable from a non-procedural image annotation template to

7   annotate images, the executable instructions capable of directing a processor to

8   perform:

9   translating the non-procedural image annotation template to image annotation

10   source code, wherein non-procedural image annotation template

11   comprises non-procedural expression of calculations and operations to

12   annotate an image with embedded text and wherein the procedural

13   image annotation source code comprises procedural expression of the

14   calculations and operations to annotate an image with embedded text;

15   and

16   compiling the image annotation source code into an image annotation

17   executable.

18

19   9.   The computer-accessible medium of claim 8, wherein the compiling further

20   comprises:

21   targeting the compiling to an instruction set of a processor of an imaging

22   system.

23

24   10.   The computer-accessible medium of claim 8, further comprising executable

25   instructions capable of directing a processor to perform:

26   transferring the image annotation executable to an imaging system.

27

28   11.   The computer-accessible medium of claim 10, wherein the imaging system is

29   a medical imaging system.

30

31   12.   The computer-accessible medium of claim 8, wherein the non-procedural

32   image annotation template is written in a language that does not require procedural

1   operations and wherein the procedural image annotation source code further

2   comprises calculations and operations to annotate an image with embedded text.

3

4   13.   A development system comprising:

5   means for translating the non-procedural image annotation template to image

6   annotation source code, wherein non-procedural image annotation

7   template comprises non-procedural expression of calculations and

8   operations to annotate an image with embedded text and wherein the

9   procedural image annotation source code comprises procedural

10   expression of the calculations and operations to annotate the image

11   with the embedded text; and

12   means for compiling the image annotation source code into a medical image

13   annotation executable, to an instruction set of a processor of an

14   medical imaging system.

15

16   14.   The development system of claim 13, further comprising:

17   means for transferring the image annotation executable to an imaging system.

18

19   15.   The development system of claim 13, wherein the non-procedural image

20   annotation template is written in a language that does not require procedural

21   operations and wherein the procedural image annotation source code further

22   comprises calculations and operations to annotate an image with embedded text.

23

24   16.   A translator recorded on a computer-accessible medium, the translator being

25   operable to receive a non-procedural image annotation template and to translate the

26   non-procedural image annotation template to Java source code, the translator

27   comprising:

28   a parser of the non-procedural image annotation template; and

29   a translator of the parsed non-procedural image annotation template to the

30   Java source code.

31

1   17.   The translator of claim 16, wherein the parser of the non-procedural image

2   annotation template further comprises:

3   an initiator of a parser of the non-procedural image annotation template, the

4   parser being compliant with the Simple API for XML standard;

5   an element starter;

6   an element parser;

7   an element ender; and

8   an element attacher.

9

10   18.   The translator of claim 16, wherein the translator of the parsed non-procedural

11   image annotation template further comprises:

12   a writer of Java class package source code;

13   a writer of Java import statement source code;

14   a writer of Java class declaration source code;

15   a writer of Java variable declaration source code; and

16   a filler of hash table representing at least one DICOM element of the Java

17   source code.

18

19   19.   The translator of claim 18, wherein the filler of hash tables representing

20   elements of the Java source code further comprises:

21   a writer of Java source code that constructs a group tree as described by the

22   elements of the non-procedural image annotation template;

23   a writer of Java source code that loads assigner attributes in an ApStyle object

24   and hashes with instances of run-time class declarations;

25   a writer of Java source code that loads a data structure adapted for storage of

26   DICOM elements with all DICOM elements that are required for

27   annotation;

28   a writer of Java source code that loads the data structure adapted for tool-tip

29   data with character strings;

30   a writer of Java source code that initializes a layout data structure that is

31   designed to hold annotation strings for each quadrant, line, and

32   segment;

1   a writer of Java source code that invalidates all variable contents, as one would

2   use if this object was assigned to control annotation of another image;

3   a writer of Java source code that generates comments that document a runtime

4   variable updates object; and

5   a writer of Java source code that evaluates expressions in order of

6   dependencies.

7

8   20.   A computer-accessible medium having executable instructions to translate a

9   non-procedural image annotation template to Java source code, the executable

10   instructions capable of directing a processor to perform:

11   parsing the non-procedural image annotation template comprising

12   initializing a parser of the non-procedural image annotation template,

13   the parser being compliant with the Simple API for XML

14   standard;

15   starting an element of the non-procedural image annotation template;

16   parsing an element of the of the non-procedural image annotation

17   template using the parser;

18   ending an element of the non-procedural image annotation template;

19   and

20   attaching the parsed element,

21   repeating the starting, parsing, ending and attaching for each element

22   of the non-procedural image annotation template, yielding a

23   parsed non-procedural image annotation template,

24   the translating further comprising:

25   translating the parsed non-procedural image annotation template to

26   Java source code.

27

28   21.   The computer-accessible medium of claim 20, wherein the translating of the

29   parsed non-procedural image annotation template further comprises:

30   writing a Java class package;

31   writing Java import statements;

32   writing Java class declarations;

1 writing Java variable declarations; and

2 filling hash tables representing DICOM elements of the Java source code.

3

4 22. The computer-accessible medium of claim 20, wherein the non-procedural

5 image annotation template further comprises a mixture of XML and conventional

6 numerical expressions based on C language syntax.

7

8 23. A method to translate a non-procedural image annotation template to Java

9 source code, the translator comprising:

10 parsing the non-procedural image annotation template comprising

11 initializing a parser of the non-procedural image annotation template,

12 the parser being compliant with the Simple API for XML

13 standard;

14 starting an element of the non-procedural image annotation template;

15 parsing an element of the of the non-procedural image annotation

16 template using the parser;

17 ending an element of the non-procedural image annotation template;

18 and

19 attaching the parsed element,

20 repeating the starting, parsing, ending and attaching for each element

21 of the non-procedural image annotation template, yielding a

22 parsed non-procedural image annotation template,

23 the translating further comprising:

24 translating the parsed non-procedural image annotation template to

25 Java source code.

26

27 24. The method of claim 23, wherein the translating of the parsed non-procedural

28 image annotation template further comprises:

29 writing a Java class package;

30 writing Java import statements;

31 writing Java class declarations;

32 writing Java variable declarations; and

1   filling hash tables representing DICOM elements of the Java source code.

2

3   25.   The method of claim 23, wherein the non-procedural image annotation

4 template further comprises a mixture of XML and conventional numerical expressions

5 based on C language syntax.

6

7   26.   A Java-based system comprising:

8   means for parsing the non-procedural image annotation template comprising:

9   means for initializing a parser of the non-procedural image annotation

10   template, the parser being compliant with the Simple API for

11   XML standard;

12   means for starting an element of the non-procedural image annotation

13   template;

14   means for parsing an element of the of the non-procedural image

15   annotation template using the parser;

16   means for ending an element of the non-procedural image annotation

17   template; and

18   means for attaching the parsed element,

19   means for repeating the starting, parsing, ending and attaching for each

20   element of the non-procedural image annotation template,

21   yielding a parsed non-procedural image annotation template,

22   the Java-based system further comprising means for translating comprising:

23   means for writing a Java class package;

24   means for writing Java import statements;

25   means for writing Java class declarations;

26   means for writing Java variable declarations; and

27   means for filling hash tables representing DICOM elements of Java

28   source code.

29

30   27.   The Java-based system of claim 26, wherein the non-procedural image

31 annotation template further comprises a mixture of XML and conventional numerical

32 expressions based on C language syntax.

1

2   28.   A computer-accessible medium comprising:

3   a template repository that is operable to store one or more non-procedural

4   image annotation templates;

5   a storer of the one or more non-procedural image annotation templates,

6   operably coupled to the template repository; and

7   a selector of the one of the non-procedural image annotation templates,

8   operably coupled to the template repository.

9

10   29.   The computer-accessible medium of claim 28, wherein the one or more non-

11   procedural image annotation templates further comprises a computed

12   tomography non-procedural image annotation template.

13

14   30.   The computer-accessible medium of claim 27, wherein the one or more non-

15   procedural image annotation templates further comprises a magnetic-

16   resonance non-procedural image annotation template.

17

18   31.   A computer-accessible medium having executable instructions to generate an

19   image annotation executable from a non-procedural image annotation template to

20   annotate images, the executable instructions capable of directing a processor to

21   perform:

22   storing the one or more non-procedural image annotation templates in a

23   template repository, and

24   selecting one of the non-procedural image annotation templates in the template

25   repository.

26

27   32.   The computer-accessible medium of claim 31, wherein the one or more non-

28   procedural image annotation templates further comprises a computed

29   tomography non-procedural image annotation template.

30

1   33.   The computer-accessible medium of claim 31, wherein the one or more non-

2   procedural image annotation templates further comprises a magnetic-

3   resonance non-procedural image annotation template.

4

5   34.   A computer-accessible medium comprising:

6   an image annotation executable; and

7   an image viewer, operable to receive the image annotation executable, an

8   image and an image annotation object, the image annotation object

9   containing text, the image viewer being operable to execute

10   instructions contained in the image annotation executable and using

11   text from the image annotation object, and the image viewer being

12   operable to generate an annotated image that is annotated with the text

13   from the image annotation object.

14

15   35.   The computer-accessible medium of claim 34, wherein the instructions further

16   comprise computer instructions that are native to a processor, the processor being

17   operably coupled through a bus to the computer-accessible medium.

18

19   36.   The computer-accessible medium of claim 34, wherein the image annotation

20   executable further comprises an image annotation executable that is compiled from a

21   non-procedural image annotation template.

22

23   37.   The computer-accessible medium of claim 34, wherein the image annotation

24   executable further comprises an annotation presentation description.

25

26   38.   The computer-accessible medium of claim 34, wherein the image annotation

27   object further comprises the image.

28

29   39.   The computer-accessible medium of claim 37, wherein the image annotation

30   object further comprises an image annotation object that conforms to standard that

31   defines data elements in object-oriented terms, each object having a unique tag, name,

32   characteristics and semantics.

1

2   40.   The computer-accessible medium of claim 34, wherein the image further

3   comprises an unannotated image.

4

5   41.   The computer-accessible medium of claim 34, wherein the image annotation

6   executable further comprises:

7   an object to select a style class object that is appropriate for imaging of a

8   modality; and

9   an instantiated style class object.

10

11   42.   The computer-accessible medium of claim 41, wherein the modality is

12   selected from a group consisting of magnetic resonance, computed tomography, X-

13   ray, ultrasound and positron emission tomography.

14

15   43.   The computer-accessible medium of claim 41, wherein the viewer further

16   comprises:

17   an object to invoke one or more methods in the object that selects a style class

18   object that is appropriate for imaging of a modality; and

19   an object to receive parsed annotation data and the image from the image

20   annotation object through a host image annotation parser, and to

21   forward the image and text to the style class object that is appropriate

22   for imaging of a modality.

23

24   44.   The computer-accessible medium of claim 43, wherein the style class object

25   that is appropriate for imaging of a modality further comprises:

26   a method to forward the image and text to a host text drawer in the viewer; and

27   a method to forward the image and text to a graphic utilities object that is

28   native to an operating system that is running on a processor that is

29   operably coupled to the computer-accessible medium, whereupon the

30   graphic utilities object is to generate the annotated image.

31

1   45.   A computer-accessible medium having executable instructions to generate and

2   view an annotated medical image, from an image annotation object and an annotation

3   presentation description, the image annotation object having an image, the annotation

4   presentation description having instructions that are native to a processor that is

5   operably coupled to the computer accessible medium, the executable instructions

6   capable of directing the processor to perform:

7   receiving the annotation presentation description and the image annotation

8   object; and

9   invoking the native instructions contained in the annotation presentation

10   description and using text from the image annotation object, to

11   generate and view the annotated medical image that is annotated with

12   the text from the image annotation object.

13

14   46.   The computer-accessible medium of claim 45, wherein the annotation

15   presentation description further comprises an annotation presentation description that

16   is compiled from a non-procedural image annotation template.

17

18   47.   The computer-accessible medium of claim 45, wherein the image annotation

19   object further comprises an image annotation object that conforms to standard that

20   defines data elements in object-oriented terms, each object having a unique tag, name,

21   characteristics and semantics.

22

23   48.   The computer-accessible medium of claim 45, wherein the annotation

24   presentation description further comprises executable instructions capable of directing

25   the processor to perform:

26   selecting a style class object that is appropriate for imaging of a modality; and

27   instantiating the selected style class object.

28

29   49.   The computer-accessible medium of claim 48, wherein the modality is

30   selected from a group consisting of magnetic resonance, computed tomography, X-

31   ray, ultrasound and positron emission tomography.

32

1 50.   The computer-accessible medium of claim 45, wherein the executable

2 instructions further comprise executable instructions capable of directing the

3 processor to perform:

4   receiving parsed annotation data and the image from the image annotation

5   object through a host image annotation parser; and

6   forwarding the image and text to a graphic utilities object that is native to an

7   operating system that is running on the processor, whereupon the

8   graphic utilities object is to generate and view the annotated image.

9

10 51.   A method to generate and view an annotated medical image, from an image

11 annotation object having an image and an annotation presentation description,

12 wherein the annotation presentation description further comprises an annotation

13 presentation description that is compiled from a non-procedural image annotation

14 template and has instructions that are native to a processor that is operably coupled to

15 the computer accessible medium, the method comprising:

16   receiving the annotation presentation description and the image annotation

17   object, the image annotation object containing text; and

18   invoking the native instructions contained in the annotation presentation

19   description and using text from the image annotation object, to

20   generate and view the annotated medical image that is annotated with

21   the text from the image annotation object.

22

23 52.   The method of claim 51, wherein the image annotation object further

24 comprises an image annotation object that conforms to the Digital Imaging and

25 Communications in Medicine standard.

26

27 53.   The method of claim 51, further comprising:

28   selecting a style class object that is appropriate for imaging of a modality,

29   wherein the modality is selected from a group consisting of magnetic

30   resonance, computed tomography, X-ray, ultrasound and positron

31   emission tomography; and

32   instantiating the selected style class object.

1

2   54.   The method of claim 51, further comprising:

3   receiving parsed annotation data and the image from the image annotation

4   object through a host image annotation parser; and

5   forwarding the image and text to a graphic utilities object that is native to an

6   operating system that is running on the processor, whereupon the

7   graphic utilities object is to generate the annotated image.

8

9   55.   A Java-based system to generate and view an annotated medical image, from

10   an annotation presentation description and an annotation object, wherein the

11   annotation object conforms to the Digital Imaging and Communications in Medicine

12   standard and has an image, wherein the annotation presentation description further

13   comprises an annotation presentation description compiled from a non-procedural

14   image annotation template and has instructions that are native to a processor, the

15   system comprising:

16   Java-based means for receiving the annotation presentation description and the

17   image annotation object, the image annotation object containing text;

18   and

19   Java-based means for invoking the native instructions contained in the

20   annotation presentation description and using text from the image

21   annotation object, to generate and view the annotated medical image

22   that is annotated with the text from the image annotation object.

23

24   56.   The Java-based system of claim 55, further comprising:

25   Java-based means for selecting a style class object that is appropriate for

26   imaging of a modality, wherein the modality is selected from a group

27   consisting of magnetic resonance, computed tomography, X-ray,

28   ultrasound and positron emission tomography;

29   Java-based means for instantiating the selected style class object;

30   Java-based means for receiving parsed annotation data and the image from the

31   image annotation object through a host image annotation parser; and

1   Java-based means for forwarding the image and text to a graphic utilities

2   object that is native to an operating system that is running on the

3   processor, whereupon the graphic utilities object is to generate the

4   annotated image.

5

6   57.   A computer system comprising:

7   a processor;

8   a bus operably coupled to the processor and

9   a computer-accessible medium comprising a viewer that is operable to access

10   computer instructions that are native to the processor, the computer

11   instructions having been generated by a processor on another computer

12   system, the computer-accessible medium being operably coupled to the

13   processor through the bus.

14

15   58.   The computer system of claim 57, wherein the viewer further comprises a

16   browser and the computer instructions further comprise computer instructions

17   encapsulated in a browser plug-in component.

18

19   59.   A computed tomography imaging system comprising:

20   a processor;

21   a bus operably coupled to the processor and

22   a computer-accessible medium comprising a viewer that is operable to access:

23   objects that conform to the Digital Imaging and Communications in

24   Medicine standard, the objects comprising an image and an

25   annotation presentation description; and

26   computer instructions that are native to the processor, the computer

27   instructions having been generated by a processor on another

28   system, the computer-accessible medium being operably

29   coupled to the processor through the bus.

30

1   60.   The computed tomography imaging system of claim 59, wherein the viewer

2   further comprises a browser and the computer instructions further comprise computer

3   instructions encapsulated in a browser plug-in component.

4

5   61.   The computer system of claim 59, wherein the computer instructions further

6   comprise computer instructions encapsulated in a dynamic link library.

7

8   62.   A computer-accessible medium comprising:

9   an encapsulation of image annotation computer instructions; and

10   a viewer that is operable to access the encapsulated image annotation

11   computer instructions.

12

13   63.   The computer-accessible medium of claim 62 wherein the encapsulated image

14   annotation computer instructions further comprise arithmetic calculations and special

15   string operations for annotation that are native to a processor that is operably coupled

16   to the computer-accessible medium.

17

18   64.   A computer-accessible medium having executable instructions to generate an

19   annotated image, the executable instructions capable of directing a processor to

20   perform:

21   invoking executable instructions that are native to the processor, the

22   executable instructions being contained in an image annotation

23   executable, wherein operands to the native computer instructions

24   include text; and

25   generating an annotated image that is annotated with the text from the image

26   annotation object.

27

28   65.   The computer-accessible medium of claim 64, wherein the executable

29   instructions further comprise executable instructions capable of directing the

30   processor to perform displaying the annotated image on a visual display in a browser.

31

1   66.   The computer-accessible medium of claim 65, wherein the image annotation

2   object further comprises an object that is encoded according to a standard that defines

3   data elements in object-oriented terms, each object having a unique tag, name,

4   characteristics and semantics.

5

6   67.   The computer-accessible medium of claim 65, wherein the original image

7   further comprises an original unannotated medical image.

8

9   68.   The computer-accessible medium of claim 65, wherein the original image

10   further comprises an original image contained with the image annotation object.

11

12   69.   The computer-accessible medium of claim 65, wherein the image annotation

13   executable further comprises an annotation presentation description.

14

15   70.   A computer-accessible medium having executable instructions to generate an

16   annotated medical image, an image annotation object and an annotation presentation

17   description, the executable instructions capable of directing a processor to perform:

18   invoking executable instructions that are native to the processor, the

19   executable instructions being contained in the annotation presentation

20   description, operands to the native computer instructions including

21   text, the image annotation object being encoded according to a

22   standard that defines data elements in object-oriented terms, the image

23   annotation object having a unique tag, name, characteristics and

24   semantics;

25   annotating an original medical image with the text from the image annotation

26   object; and

27   displaying the annotated image on a visual display.

28

29   71.   The computer-accessible medium of claim 70, wherein the executable

30   instructions further comprise annotation calculations and operations.

31

1   72.   The computer-accessible medium of claim 70, wherein the displaying further
2   comprises a displaying the annotated image in a browser.
3
4   73.   The computer-accessible medium of claim 70, wherein the processor further
5   comprises a processor of a medical imaging device.
6
7   74.   The computer-accessible medium of claim 70, wherein the original image
8   further comprises an original image contained with the image annotation object.
9
10 75.   An apparatus comprising:
11   a processor; and
12   an encapsulation of image annotation computer instructions, the computer
13   instructions being native to the processor, the computer instructions
14   being generated by a processor on another apparatus.
15
16 76.   A method of updating a medical imaging system with new annotation
17 calculations, the method comprising:
18   generating on a development system an image annotation executable that
19   includes computer instructions that are native to a processor of the
20   medical imaging system; and
21   forwarding the image annotation executable through the Internet to the
22   medical imaging system.
23
24 77.   The method of claim 76, wherein the image annotation executable further
25   comprises an image annotation executable that package is a form selected
26   from the group consisting of a browser-plugin and a dynamic link library.
27
28 78.   A method of updating a medical imaging system with new annotation
29 calculations, the method comprising:
30   receiving an image annotation executable that includes computer instructions
31   of the new annotation calculations that are native to a processor of the
32   medical imaging system; and

1 storing the image annotation executable in a location that is accessible to a

2 viewer that is enable to access the image annotation executable.

3

4 79. The method of claim 78, wherein receiving further comprises:

5 receiving the image annotation executable from a manufacturer of the medical

6 imaging system.

7

8 80. The method of claim 78, wherein the medical imaging system further

9 comprises a computer tomography medical imaging system.

10

11 81. The method of claim 78, wherein the medical imaging system further

12 comprises a magnetic imaging medical imaging system.